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DESCRIPTION

1. TITLE OF THE INVENTION

Method of Washing and Cleaning Water Distribution Pipe
etc.

2. CLAIM

A method of washing and cleaning a water distribution pipe etc., in which a quick-freezing apparatus is provided in the rear of the water distribution pipe, a pressurization discharge apparatus is provided at the back thereof, the quick-freezing apparatus quickly freezes water in the pipe at a portion where the quick-freezing apparatus is in contact with an outer circumferential surface part of the water distribution pipe so as to form a cylindrical frozen ice cube, subsequently the pressurization discharge apparatus applies pressure to the water in the pipe from the back so as to discharge the frozen ice cube in a forward direction to run in sliding contact with an inner circumferential surface of the water distribution pipe, and by repeating these, scale adhered to the inner circumferential surface is removed gradually and washed away to drain as the frozen ice cube passes through the water distribution pipe, whereby the inside of the water distribution pipe being long and having bent portions may be washed and cleaned.

3. DETAILED DESCRIPTION OF THE INVENTION

Technical Field

Conventionally, a water distribution pipe is washed and cleaned such that, in order to remove scale etc. generated in the pipe wall, water is fulfilled in the pipe, a high pressure is applied instantaneously to one side, and a water hammer operation is caused in the pipe, so as to remove the scale etc. in the pipe to be washed and cleaned. Moreover, by using this water hammer operation, sand and ice cubes are supplied and forced by pressure into the pipe in advance so as to remove the scale etc. and wash and clean it, however, the sand and ice cubes float and drift in the water and affect peeling and removing the scale, thus it is not possible to remove the scale etc. completely. Further, in a post process, it needs efforts and time, thus being very inconvenient. Moreover, recently a synthetic resin cap having semi-hard foaming elasticity is provided in the pipe and a hydraulic pressure or an air pressure is applied to the cap from its back so as to run the cap within the water distribution pipe, so that the cap is compressed also due to resistance within a pipe, expands radially, being brought into pressure and sliding contact with the pipe inner surface by the above-mentioned hydraulic pressure and air pressure power, during which the scale etc. adhered to the pipe inner surface is peeled off, pushed forward to be removed and is drained and discharged together with water. However, when the cap passes through a bent pipe portion, it sometimes stops within the bent pipe at its inner surface and closes the pipe.

Thus, there is a possibility that it would not move even if a high pressure is applied to the back, so that it may block the pipe and needs considerable work to replace. Further, in addition it is necessary to remove the cap together with the scale out of the pipe, so that a handling operation is also complicated and very inconvenient.

As such, the present invention provides a method of washing and cleaning water distribution pipe etc., characterized by using a simple apparatus wherein the scale etc. in the pipe is very easily removed for any water distribution pipe, either a straight pipe or a bent pipe, without supplying or interposing any interposing material in the pipe; a quick-freezing apparatus is provided in the rear of the water distribution pipe so that the scale and sewage may be pushed out and discharged simultaneously by leaving a sewer valve open when draining; a pressurization discharge apparatus is provided in the back; the quick-freezing apparatus quickly freezes the water, in the pipe, where the quick-freezing apparatus is in contact with the water distribution pipe so as to form a cylindrical frozen ice cube; if the ice cube is pressurized by means of the pressurization discharge apparatus provided in the back, the above-mentioned frozen ice cube is discharged forward into the pipe, travels in sliding contact with the pipe wall, during which the scale is also peeled off and removed; after running a certain distance in sliding contact with the wall, the frozen ice cube melts into water, which merges into

the sewage including the scale and can be discharged as it is through the sewage valve easily, the scale etc. in the water distribution pipe is removed safely and reliably, and the washing and cleaning can be performed by a simple operation. Hereafter, with reference to the drawings, an embodiment of the method will be described.

A water distribution pipe (1) is such that a quick-freezing apparatus (A) may be formed in the rear and the water distribution pipe (1) may extend through and be in contact with the inside of the quick-freezing apparatus (A) in a flow direction of water. Furthermore, in the back and through a T-tube (7), one end is interconnected with a water supply valve (2) and another end is interconnected with a force feed valve (4); a pressurization discharge apparatus (B) is provided; a breeches pipe (8) is connected to a terminal in the flow direction of the water in the pipe; a sewer valve (3) and a valve for sewage drain (5) are attached to both the ends respectively; sewage (b) containing scale (a) is drained.

As for the quick-freezing apparatus (A), a container (6) is cast in a doughnut-like shape or formed in a box shape so that the water distribution pipe (1) may pass through it and contact surfaces may be in close contact with each other; the water distribution pipe (1) passes through; a refrigerant liquid (o) of 70° degree below the freezing point or more, such as liquefied carbon dioxide, is caused to flow from a bomb (9) and accommodated in the inside; the water flowing inside the

water distribution pipe (1) is quickly cooled and solidified, so that a frozen ice cube (C) is formed in close contact with the whole pipe bore diameter. The frozen ice cube (C) is solidified in close contact with the contact portion in the water distribution pipe (1) so as to block the inside of the pipe, so that it stops the water from flowing in the pipe and the pipe is closed. Then, the frozen ice cube (C) is pressurized by the pressurization discharge apparatus (B) and forced to separate from the pipe circumferential wall surface so as to be discharged in the pipe, and travels in sliding contact with the inner wall surface of the water distribution pipe (1), removes the scale (a) so as to peel it out of the inner wall side of the water distribution pipe (1); as it slows down gradually it melts into water and is drained through the sewage drain valve (5) together with the sewage (b) containing the scale (a).

The pressurization discharge apparatus (B) is disposed through the T-tube (7) between the quick-freezing apparatus (A) and the water supply valve (2) which are provided in the rear of the water distribution pipe (1); the force feed valve (4) is connected with a lower end of the T-tube (7) and further a compressor (10) is connected; this compressor (10) forces and feeds the hydraulic-pressure power or a compressed air power towards the water distribution pipe (1), to thereby considerably pressure the frozen ice cube (C) cast by the quick-freezing apparatus (A) in the water distribution pipe

(1), separate the frozen ice cube (C) in close contact with the water distribution pipe (1), and discharge and run it inside the water distribution pipe (1). Therefore, the frozen ice cube (C) runs as if a projectile passes through a gun barrel, sliding inside the water distribution pipe (1), so that the adhering scale (a) within the water distribution pipe (1) is removed by the run pressure. As it runs farther, the frozen ice cube (C) melts away and loses the performance of peeling the scale etc., so that it is left. After the previous frozen ice cube (C) is discharged, the next frozen ice cube (C) to be discharged is cast and then discharged by the pressurization discharge apparatus (B) into the water distribution pipe (1) so as to run in sliding contact with the inner surface and instantly arrive, without any resistance, in a position where the scale (a) is not removed through the water distribution pipe (1) which has been washed and cleaned by the previous frozen ice cube (C). Similar to the above description, from the position it runs in sliding contact with the inside of the water distribution pipe (1) so as to remove the scale (a). By repeating these, it is possible to gradually remove the scale (a) in the long water distribution pipe (1), and it runs smoothly to remove the scale when passing through the bent pipe portion.

Through the breeches pipe (8), the sewage drain valve (5) and the sewer valve (3) for tap water (b) are connected with the end, in the flow direction, of the water distribution pipe

(1); the sewer valve (3) and the sewage drain valve (5) are closed when washing and cleaning; the sewage drain valve (5) is opened after washing and cleaning; after draining the sewage (b) containing the scale (a), they are closed; when opening the sewer valve (3), the tap water (b) flows via the sewer valve (3). Moreover, after opening the sewage drain valve (5) and draining the water distribution pipe (1), the frozen ice cube (C) can be discharged and run so as to remove the scale (a).

Since the present invention is arranged as described above, the tap water (b) flowed in from the water supply valve (2) which is opened passes through the T-tube (7) and flows into the water distribution pipe (1). When it arrives in the position of the quick-freezing apparatus (A), the tap water (b) at the contact portion of the quick-freezing apparatus (A) and the water distribution pipe (1), flowing through the water distribution pipe (1) cooled by refrigerant fluid (c), such as liquefied carbon dioxide in the container (6) of a quick-freezing apparatus (A), is cooled and starts to freeze quickly at the inner circumferential surface of the water distribution pipe (1) so as to be solidified and the cylindrical frozen ice cube (C), to thereby close the pipe and be in close contact with the inside of the pipe. Then, opening the force feed valve (4) of the pressurization discharge apparatus (B) at this time, when the hydraulic-pressure power or the compressed air power is force fed to the water distribution pipe (1) by means of the compressor (10); the hydraulic-

pressure power or the compressed air power considerably pressures the back of the above-mentioned frozen ice cube (C), discharges the frozen ice cube (C) with a considerable power; it runs in sliding contact with the inner circumferential surface of the water distribution pipe (1); accordingly it peels the scale (a) adhering in the pipe to be pushed out together with the tap water (b); and, the frozen ice cube (C) begins to melt into water after running to some extent in the water distribution pipe (1), merges into sewage (b'), leaving the scale in the pipe; it is drained from the sewage drain valve (5) automatically; the remaining scale is removed by the next frozen ice cube (C), and moves forward one after another. As such, the tap water (b) is frozen and solidified within the water distribution pipe (1) so as to prepare the cylindrical frozen ice cube (C), which is discharged and then the next frozen ice cubes are cast intermittently and discharged one after another by means of the pressurization discharge apparatus (B), so that the scale (a) adhering in the long water distribution pipe (1) can be removed gradually if it is in the bent pipe portion; the long water distribution pipe having the bent portion allows the frozen ice cube (C) to run smoothly making to slide, without blocking the pipe; the frozen ice cube (C) melts away by itself so that it is not necessary to remove it and it can be drained together with the sewage (b') containing the scale (a) easily, and the washing and cleaning of the inside of water distribution pipe (1) can be carried

out easily. In the case of the washing and cleaning, although the water supply valve (2) and the sewer valve (3) are closed, the sewage drain valve (5) may be a free state where it can arbitrarily be either opened or closed.

As described above, according to the present invention, the quick-freezing apparatus is provided in the rear of water distribution pipe; the pressurization discharge apparatus is provided in the back; the quick-freezing apparatus quickly freezes the water, in the water distribution pipe, being at a portion where the quick-freezing apparatus is in contact with an outer circumferential surface part of the water distribution pipe so as to form the cylindrical frozen ice cube; subsequently the pressurization discharge apparatus applies pressure to the water in the water distribution pipe from the back of the water distribution pipe so as to discharge the frozen ice cube in the forward direction and run in sliding contact with the inner circumferential surface of the water distribution pipe; and by repeating these, the scale adhered to the inner circumferential surface is removed gradually and pushed and washed away to drain as the frozen ice cube passes through the water distribution pipe, whereby the inside of the water distribution pipe being long and having bent portions may be washed and cleaned. Therefore it provides advantages that in the case of the washing and cleaning the scale can be removed and drained safely, reliably and sanitarily so as to perform the washing and cleaning without feeding foreign substances,

such as a grain, a small solid, and a cap, in the water distribution pipe, without floating them in the water within the pipe, and without damaging devices, such as the water distribution pipe and water feeding/draining valves.

4. BRIEF DESCRIPTION OF THE DRAWINGS

The drawings show an embodiment of the method of washing and cleaning the water distribution pipe etc. according to the present invention, and Fig. 1 is a side elevation, partially in cross section. Fig. 2 is a partially enlarged vertical longitudinal sectional view; Fig. 3 is a sectional front elevation along the line (X)-(X).

- (A) -- quick-freezing apparatus
- (B) -- pressurization discharge apparatus
- (C) -- frozen ice cube
- (1) -- water distribution pipe
- (a) -- scale
- (b) -- tap water
- (c) -- refrigerant fluid

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⑭ 通水管等の洗浄清掃方法

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明 細 書

1. 発明の名称

通水管等の洗浄清掃方法

2. 特許請求の範囲

通水管の後部に急冷装置を設け、その後方に加圧発射装置を備え、急冷装置が通水管の一部外周面に接触する部分の管内の水を急激に凍結させて、円筒状の凍結水体を形成せしめ、然る後、加圧発射装置により通水管内の後方より管内の水に圧力を与えて、凍結水体を前方に向けて発射させ、通水管の内周面に擦接走行せしめ、これを反覆繰り返すことにより、凍結水体が通水管内を通過する際にその内周面に付着するスケールを徐々に取り除き、押し流し排水して、長尺にして且曲部を有する通水管内を洗浄清掃せしめるようにしたことを特徴とする通水管等の洗浄清掃方法。

3. 発明の詳細な説明

従来は通水管を洗浄清掃し、管内壁に生じた

スケール等を除去するために管内に水を充填させて、一方から大きな圧力を瞬間的に与えて、管内にウォーターハンマー作用を起させ、管内のスケール等を取り除き洗浄清掃したり、又このウォーターハンマー作用を利用してあらかじめ、管内に砂や水塊を投入し、これを管内に圧送せしめ、スケール等を取り除き洗浄清掃していたが、この砂や水塊が水中に浮遊動したりしてスケールを剥ぎ取り除去するが難い、仲々完全にスケール等を取り除くことができず、且又該処理に於いても予固時間を要し、極めて不便であつた。又近時に於いては半硬質の樹脂弾性を有する合成樹脂製弾体を管内に擦接せしめ、その弾体の背後から水圧又は空気圧等を加圧して、弾体を通水管内に走行せしめ、管内の抵抗と相俟つて、この弾体は圧縮されて半径方向に膨張し、管内面に圧接密着し、前記水圧、空気圧力によつて管内周面を圧接擦動し、その際に管内面に付着せるスケール等を剥がし前方に押し出して取り除き水と共に排水排出せしめてい

たが、時としてこの帽体が曲管部を通過する場合にこの曲管部内面に止まり、管内を閉口し、強力な圧力を背後から加えても、仲々起動せず管詰りを起す危険が生じ、大掛りな取換作業をせねばならず、その上スケールと共にこの帽体を管内より取り除く作業も加わつて、作業上の取り扱いも複雑化し極めて不便であつた。

そこで本発明は直管、曲管何れの通水管でも、管内に何物も介在物を投入介在させることなく、極めて簡単に管内のスケール等を取り除き、排水に際しても、そのまま排水バルブを開放することによつて、スケールと汚水とを同時に押出し排水し得るように、通水管の後部に急冷装置を設け、その後方に加圧発射装置を備え、急冷装置が通水管に接触する管内部の水を急激に凍結させて、円筒状の凍結水体を形成せしめ、これを背後に設けた加圧発射装置より加圧すれば、前記凍結水体は前方に向つて管内に発射され、管内壁面を摺擦動しながら走行し、その際スケールを剥ぎ取り除き、或る程度長さ摺擦動走

水管(1)を貫通し、その内部には液化炭酸ガス等の零下70°度以上の冷媒液体(6)をポンプ(9)より流入収納せしめ、通水管(1)内を流動する水を急速に冷却固化せしめて、凍結水体(10)を管口徑に準つて密着成形する。この凍結水体(10)は通水管(1)内の接触部に管内を封鎖する状態で、密着して固化し、管内の水の流れを止め、管を閉口する。そして、この凍結水体(10)は加圧発射装置(4)の加圧により管周壁面から強制的に離され、管内に発射された状態となり、通水管(1)の内壁面を摺擦動しながら走行し、スケール(2)を通水管(1)の内壁面より剥ぎ取るように取り除き、徐々にスピードが落ちると同時に水解し、スケール(2)を含んだ汚水(3)と共に汚水排水バルブ(5)より排水される。

加圧発射装置(4)は通水管(1)の後部に設けた急冷装置(4)と給水バルブ(2)との間にT字管(7)を介して接続し、このT字管(7)の下端には圧送バルブ(4)を連結し、更にコンプレッサー(4)に接続せしめ、通水管(1)内に向つて、このコンプレッサー

行すると、凍結水体は解けて水となり、スケールを含んだ汚水と合流して簡単に排水バルブよりそのまま排水し得るようにした単純な装置で、通水管のスケール等を安全且安心して取り除き、且簡単な作業で洗浄清掃し得るようにしたことを特徴とする通水管等の洗浄清掃方法を提供するにあり、以下その方法の一実施例について図面で説明する。

通水管(1)は水の流れ方向に対して、その後部に急冷装置(4)を設け、この急冷装置(4)内を急冷装置(4)が貫挿接触するようになし、更にその後方にT字管(7)を介して、一方に給水バルブ(2)を他方に圧送バルブ(4)を連結して、加圧発射装置(4)を接続せしめ、管内の水の流れ方向の末端には二又管(8)を連結し、その両端には夫々排水バルブ(3)及び汚水排水用バルブ(5)を夫々取付け、スケール(2)を含んだ汚水(3)を排水するようになる。

急冷装置(4)は通水管(1)を貫挿し得るように且その接触面が互いに密接するようにドーナツ状の管線(4)を成型するか又は曲体状に形成して、通

管により、水圧力又は空気圧力を圧送せしめ、通水管(1)内に急冷装置(4)により成形された凍結水体(10)を強力に押圧させ、通水管(1)に密着せる凍結水体(10)を剥離させ、通水管(1)内を発射走動せしめる。従つて凍結水体(10)はあたかも銃身内を通過する弾丸の如く、通水管(1)の内面を摺擦しながら走行するをもつて、その走行圧力で通水管(1)内に付着せるスケール(2)は取り除かれる。そして遠方に走行するに従つて、凍結水体(10)は解け、スケール等を剥離取り除く力はなくなり取り残すが、次に発射される凍結水体(10)が前の凍結水体(10)の発射された後成形され、加圧発射装置(4)により、通水管(1)内を発射し、内面を摺擦走行し前の凍結水体(10)によつて洗浄清掃された通水管(1)内に何等の抵抗もなく瞬時にスケール(2)の除去されていない位置に達し、前記同様、ここから通水管(1)内を摺擦走行し、スケール(2)を取り除き、これを繰り返すことによつて徐々に長尺の通水管(1)のスケール(2)を取り除くことができると共に曲管部を通過する場合も同

らかに走行してスケールを取り除く。

通水管(1)の流れ方向の末端には二又管(2)を介して、汚水排水バルブ(5)と水道水(b)の排水バルブ(3)を連結せしめて洗浄清掃中は排水バルブ(3)、汚水排水バルブ(5)を閉口し、洗浄清掃後、汚水排水バルブ(5)を開き、スケール(a)を含んだ汚水(b)を排水せしめた後閉口し、排水バルブ(3)を開口すると、水道水(b)は排水バルブ(3)を通じて流動する。又汚水排水バルブ(5)を開いて、通水管(1)の水抜きを施した後、凍結水体(c)を発射走行させて、スケール(a)を取り除くこともできる。

本発明は以上のように構成したから、開口された給水バルブ(2)から流入する水道水(b)は、二又管(7)を通り、通水管(1)へ流れ込み、急冷装置(A)の位置に達したとき、急冷装置(A)の容器(6)内の液化炭酸ガス等の冷媒液体(d)によつて、その急冷装置(A)と通水管(1)との接触部分に於いて、冷却された通水管(1)によつて流動する水道水(b)は急速に通水管(1)の内周面から冷却凍結し始め、固化して円筒状の凍結水体(c)となり、管内を閉

滞らかに凍結水体(c)を摺擦走行させることができるし、凍結水体(c)は先方で解けるをもつて敗えてこれを取り除く必要もなく容易にスケール(a)を含んだ汚水(b)と共に排水することができ、容易に通水管(1)内を洗浄清掃し得る。

洗浄清掃に際して、給水バルブ(2)、排水バルブ(3)は閉じておくが汚水排水バルブ(5)は開閉自由な状態で何れにしても任意である。

本発明は以上のように通水管の後部に急冷装置を設け、その後方に加圧発射装置を備え、急冷装置が通水管の一部外周面に接触する部分の通水管内の水を急激に凍結させて、円筒状の凍結水体を形成せしめ、然る後加圧発射装置により、通水管内の後方より通水管内の水に圧力を与えて、凍結水体を前方に向けて発射させ、通水管の内周面に摺擦走行せしめ、これを反覆繰り返すことにより、凍結水体が通水管内を通過する際にその内周面に付着するスケールを徐々に取り除き、押し流し排水して、長尺にして且曲部を有する通水管内を洗浄清掃せしめ得るよ

うすると共に管内に密着する。そして、このとき加圧発射装置(4)の圧送バルブ(4)を開いて、コンプレッサー(4)により水圧力又は空気圧力を通水管(1)に圧送せしめると、その水圧力又は空気圧力は前記凍結水体(c)の背後を強力に押出し、凍結水体(c)を強力な力で発射させ、通水管(1)の内周面を摺擦しながら走行し、それに伴つて、管内に付着するスケール(a)を剥ぎ落し水道水(b)と共に押し流し、或る程度通水管(1)内を走行した凍結水体(c)は解け始め水となり、管内のスケールを残して汚水(b)と合流し、自然に汚水排水バルブ(5)から排水し、次の凍結水体(c)により残されたスケールを取り除いて次々に前進する。このように通水管(1)内で水道水(b)を凍結固化させて、円筒状の凍結水体(c)を作り、これを発射後続いて次の凍結水体を間欠的に成形せしめて、加圧発射装置(4)により、次々に発射すれば、長尺の通水管(1)内に付着するスケール(a)は曲部でも徐々に除去することができ、長尺で且曲部があるような通水管でも管詰りさせることなく

うにしたから、洗浄清掃するに就して、程、小固形物、帽体等の異物を通水管内に投入することなく且又管内の水に浮遊させることもなく、通水管や給排水バルブ等の器具を損傷させることなく、安全且安心してスケールを衛生的に取り除き排出して洗浄清掃し得る効果がある。

4. 図面の簡単な説明

図面は本発明の通水管等の洗浄清掃方法を示す一実施例であり、第1図は側面図で一部切欠する。第2図は要部の拡大せる縦断側面図、第3図は(A)-(D)線に沿える縦断正面図である。

図 中

- (A) … 急 冷 装 置
- (4) … 加 圧 発 射 装 置
- (c) … 凍 結 水 体
- (1) … 通 水 管
- (a) … スケール
- (b) … 水 道 水
- (d) … 冷 媒 液 体

第 1 図

